Satellite-Based ADS-B Operations Flight Test

Problem Statement

- There are plans to base ADS-B receivers on satellites in the 2015+ timeframe, but the utility/ effectiveness of overhead collection/ processing/re-broadcast of 978MHz UAT and 1090ES ADS-B data has not been fully evaluated in a relevant environment.

- Requested flight will validate space-based ADS-B operation for transoceanic and polar area use and to support range operations (launches & re-entries) at emerging spaceports and mobile ranges.

- Potential Users: FAA, satellite-based ADS-B providers, spaceports, mobile ranges, NASA, DoD ranges

Technology Development Team

- PI: Russ Dewey, Near Space Corporation, 503-842-1990 russ.dewey@nsc.aero

- Payload Material Support: FAA-AST (Nick Demidovich; 202-267-8437)

- Potential Partners: CNS Aviation, Garmin Ltd, Spaceport America, Iridium Corporation

Proposed Flight Experiment

Experiment Readiness:

- Experiment can be ready for flight by April 2013

Test Vehicles:

- Near Space Corporation's Small Balloon System (SBS)

Test Environment:

- Test conducted at 100,000' ambient conditions

- No shock/vibration or G constraints

- TAMLACE flown by FAA and other international ATC service providers to certify ADS-B system operations

  - Will be tested in NSC's altitude chamber (pressure & temperature) to 100,000' prior to flight. System inspection/ analysis does not indicate any potential issues except changing battery chemistry & adding insulation.

Test Apparatus Description:

- TAMLACE ADS-B transceiver aloft as a satellite surrogate receiving operational ADS-B data

- Received 978MHz UAT and 1090ES ADS-B messages are time-stamped and recorded on RS-232 data recorders for later analysis vs. ground truth data from the FAA.

Technology Maturation

- Current TAMLACE ADS-B system is COTS: TRL-9 for aircraft use; TRL-4 for HA use

- Will be validated for operation at 100kft through pre-flight altitude chamber testing → TRL-7

- After flight, system will be TRL-8/9 for high altitude use.

- RCATS Datalogger is TRL-9

Objective of Proposed Experiment

- Evaluate the effectiveness of future satellite-based ADS-B receivers to enhance automated air traffic control over currently non-covered areas.

- Evaluate the effectiveness of collecting 978MHz UAT and 1090ES messages by overhead platforms.

- Evaluate potential for high altitude ADS-B receivers to support range control at spaceports/mobile ranges.

- ADS-B data collected by the proposed experiment will be made available for evaluation against real-time operational ADS-B data to determine increased coverage, % of missed contacts, and potential issues with overhead collection architectures.

5.2.4. Flight & Ground Systems; 5.4.5. Relative & Proximity Navigation; 9.2.4. GN&C Sensors